

8256

FINAL



U.S. Army
Environmental
Center

**No Further Action Decision Under CERCLA
Study Area 51: O'Neill Building**

**Fort Devens Main Post Site Investigation
Fort Devens, Massachusetts**

Prepared for:

U.S. ARMY ENVIRONMENTAL CENTER
ABERDEEN PROVING GROUND, MARYLAND 21010

Prepared by:

ARTHUR D. LITTLE, INC.
25 Acorn Park
Cambridge, Massachusetts 02140-2390

DTIC QUALITY INSPECTED 3

DISTRIBUTION STATEMENT A

**Approved for public release;
Distribution Unlimited**

SEPTEMBER 1995

19970821 008

FINAL

Arthur D Little

**No Further Action Decision
Under CERCLA**

**Study Area 51: O'Neill
Building**

**Fort Devens
Main Post Site
Investigation,
Fort Devens,
Massachusetts**

Submitted to

**U.S. Army Environmental
Center (USAEC)
Aberdeen Proving
Ground, Maryland**

**Revision 0
September 1995**

**Arthur D. Little, Inc.
Acorn Park
Cambridge, Massachusetts
02140-2390**

QC QUALITY INSPECTED 3

ADL Reference 67064

DAAA15-91-D-0016/0004

Table of Contents

List of Acronyms and Abbreviations	iii
Executive Summary	iv
1.0 Introduction	1
2.0 Background and Physical Setting	2
2.1 Fort Devens Description and Land Use	2
2.2 Regional Geology	2
2.3 Regional Hydrogeology	3
2.4 Study Area Description and History	3
2.4.1 Study Area Description and Land Use	3
2.4.2 Background and Physical Setting	4
2.4.3 Geology of Study Area 51	5
2.4.4 Hydrogeology of Study Area 51	5
3.0 Site Investigation	6
3.1 Site Investigation Report	6
3.2 Supplemental Site Investigation	6
3.3 Preliminary Risk Evaluation	7
3.3.1 Human Health Soil Risk Evaluation Methodology	7
3.3.2 Ecological Soil Risk Evaluation	8
4.0 Contamination Assessment	9
4.1 Soil Sampling	9
4.2 Ground Water	9
5.0 Preliminary Risk Evaluation	11
5.1 Surface Soils	11
5.2 Ground Water	11
6.0 Conclusions	12
7.0 Decision	13
8.0 References	14

Table of Contents

List of Figures

- Figure 2:-1 Location of Study Areas Within Fort Devens
Figure 4-1: Study Area 51 Soil and Ground Water Sample
Locations

List of Tables

- Table 4-1: Study Area 51 Analytes in Soil

List of Acronyms and Abbreviations

BAF	Bioaccumulation Factor
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CMR	Code of Massachusetts Regulations
DoD	Department of Defense
EMO	Environmental Management Office
Enhanced PA	Enhanced Preliminary Assessment
EPA	United States Environmental Protection Agency
IRP	Installation Restoration Program
MCP	Massachusetts Contingence Plan
MADEP	Massachusetts Department of Environmental Protection
MEP	Master Environmental Plan
MSL	Mean Sea Level
NPL	National Priorities List
PA	Preliminary Assessment
PCB	Polychlorinated Biphenyl
PCL	Protective Contaminant Level
PID	Photoionization Detector
PRE	Preliminary Risk Evaluation
PQL	Practical Quantitation Limit
NRIR	Non-Dispersive Infrared
SA	Study Area
SARA	Superfund Amendments and Reauthorization Act
SI	Site Investigation
SSI	Supplemental Site Investigation
TPHC	Total Petroleum Hydrocarbons
µg/g	Micrograms perm gram
USAEC	United States Army Environmental Center

Executive Summary

Investigations of Study Area (SA) 51 - O'Neill Building at Fort Devens, Massachusetts, have resulted in the decision that no further studies or remediation are required at this site. SA-51 was identified in the Federal Facilities Agreement between the U.S. Environmental Protection Agency and the U.S. Department of Defense as a potential site of contamination.

Fort Devens was placed on the National Priorities List under the Comprehensive Environmental Response, Compensation, and Liability Act as amended by the Superfund Amendments and Reauthorization Act on December 21, 1989. In addition, under Public Law 101-510, the Defense Base Closure and Realignment Act of 1990, Fort Devens was selected for cessation of operations and closure. In accordance with these acts and to support the overall mission of environmental restoration and base closure, numerous studies have been conducted that address SAs at Fort Devens, including a Master Environmental Plan (MEP), an Enhanced Preliminary Assessment (Enhanced PA), and Site Investigation Reports.

SA-51 is located adjacent to the O'Neill Building, on the western side of Lovell Street, across from SA-11 and the Nashua River. The O'Neill Building Compound serves as a training center for the Intelligence School. Training operations are conducted using transmitting vehicles and generators at 12 gravel-covered pads.

The MEP and Enhanced PA originally identified in SA-51 as area between Pads 10 and 11 where a history of spills and removal actions have been documented. Approximately 15 gallons of diesel fuel were spilled in an area between Pads 10 and 11 as a result of a petcock left open on a mobile generator. During inspection of the spill area, evidence of additional contaminated soils was observed. According to the MEP and Enhanced PA, 200 cubic yards of soil was removed, but soils remained that showed evidence of contamination. Sample results reportedly showed 90 to 200 µg/g of total petroleum hydrocarbons (TPHC). The SA was expanded to include all 12 pads to address the possibility that similar spill incidents had occurred at other pad areas.

The Site Investigation of SA-51 was completed in 1993 in conjunction with 12 other study areas as part of the Main Post Site Investigation. The Supplemental Site Investigation was completed in 1994.

No evidence of extensive or high-concentration petroleum contamination was observed during the investigation. The results of the investigation indicate that there is no TPHC contamination in ground water. The levels of TPHC and metals detected in soils indicate local areas of low-concentration petroleum contamination consistent with the historical use of the SA for diesel fuel-powered equipment. Based on the results of the preliminary risk evaluation, the detected levels of these analytes are not likely to pose an unacceptable risk to human health or the environment.

Executive Summary

1 On the basis of the findings at SA-51, there is no evidence or reason to conclude that
2 the use of SA-51 for training operations has caused significant environmental
3 contamination or pose a threat to human health or the environment. The decision has
4 been made to remove SA-51 from further consideration in the Installaton Restoration
5 Program (IRP) process.
6

1.0 Introduction

This decision document has been prepared to support a No Further Action decision at Study Area (SA) 51 - O'Neill Building at Fort Devens, Massachusetts. The report was prepared as part of the U.S. Department of Defense (DOD) Base Realignment and Closure (BRAC) program to assess the nature and extent of contamination associated with site operations at Fort Devens. Under Public Law 101-510, the Defense Base Closure and Realignment Act of 1990, Fort Devens has been selected for cessation of operations and closure. An important aspect of BRAC actions is to determine environmental restoration requirements before property transfer can be considered. Studies at SA-51 were conducted to support this overall mission.

In conjunction with the Army's Installation Restoration Program (IRP), Fort Devens and the U.S. Army Environmental Center (USAEC) initiated a Master Environmental Plan (MEP) in 1988. The MEP consists of assessments of the environmental status of SAs, specifies necessary investigations, and provides recommendations for response actions with the objective of identifying priorities for environmental restoration at Fort Devens. SA-51 was identified as a potential source of contamination in the MEP (Biang et. al., 1992). On December 21, 1989, Fort Devens was placed on the National Priorities List (NPL) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA).

An Enhanced Preliminary Assessment (Enhanced PA) (Roy F. Weston, 1992) was also performed at Fort Devens to address areas not normally included in the CERCLA process. In 1993, DoD, through USAEC, also initiated a Site Investigation (SI) of SA-51 along with 12 other SAs as part of the Main Post Site Investigation at Fort Devens. The Supplemental Site Investigation (SSI) was conducted in 1994. The Supplemental Site Investigation Report (Arthur D. Little, Inc., 1995) recommended No Further Action at SA-51.

2.0 Background and Physical Setting

2.1 Fort Devens Description and Land Use

Fort Devens is located in Middlesex and Worcester Counties, Massachusetts, approximately 35 miles west of Boston, Massachusetts. Fort Devens is located in portions of four towns - Ayer, Harvard, Lancaster, and Shirley. Fort Devens currently covers approximately 9,280 acres, consisting of the Main Post, North Post, and South Post areas. Massachusetts Highway Route 2 crosses Fort Devens and separates the Main Post from the South Post (Figure 2-1).

The majority of the facilities at Fort Devens lie within the Main Post, located north of Massachusetts Highway Route 2. The Main Post provides all of the on-post housing, including over 1,700 family units and 9,800 bachelor units (barracks and unaccompanied officers' quarters). Other facilities on the Main Post include community services (e.g., the shoppette, cafeteria, post exchange, bowling alley, golf course, and hospital), administrative buildings, classroom and training facilities, maintenance facilities, and ammunition storage.

The South Post is located south of Route 2 and contains training areas, ranges, and a drop zone. The North Post abuts the Main Post to the north of West Main Street in Ayer. The principal activities on the North Post are the Waste Water Treatment Plant and the Moore Army Airfield.

The terrain surrounding Fort Devens includes rolling areas and wooded hills. Fort Devens is located in the Nashua River Basin, and approximately 8 miles of the river, running from south to north, lie within the reservation boundaries (Figure 2-1). Several lakes and ponds are located within Fort Devens. Land surface elevations within Fort Devens range from about 200 feet above mean sea level (MSL) along the Nashua River on the northern boundary to 450 feet above MSL in the southern portion of the installation.

Ayer, Harvard, Shirley, and Lancaster are zoned for residential, commercial, and limited industrial development. All have fewer than 7,000 residents.

2.2 Regional Geology

The surficial geology throughout most of Fort Devens is characterized by glacially derived unconsolidated sediments. A mantle of Pleistocene-age glacial till, outwash, and lacustrine (lake) deposits, ranging in thickness from a few inches to approximately 100 feet, blanket the irregular bedrock surface underlying Fort Devens. The glacial lake deposits consist chiefly of sand and gravelly sand. Post-glacial deposits consist mostly of river-terrace sands and gravels; fine alluvial sands and silts beneath modern floodplains; and muck, peat, silt, and sand in swampy areas.

2.0 Background and Physical Setting

The surficial deposits are underlain by a complex assemblage of intensely folded and faulted metasedimentary rocks with occasional igneous intrusions. Depth of bedrock ranges from approximately 100 feet to ground surface, where it outcrops at Shepley's Hill. Bedrock is primarily unweathered to only slightly weathered at Fort Devens, as is typical in glacial terrain.

2.3 Regional Hydrogeology

Fort Devens lies within the Nashua River drainage basin. The Nashua River flows south to north through the installation, and is the eventual discharge locus for all surface water and ground water flow at the installation. The water of the Nashua River has been assigned to Class B under Commonwealth of Massachusetts Regulations (CMR). Class B surface water is "designated for the uses of protection and propagation of fish, other aquatic life and wildlife, and for primary and secondary contact recreation" (314 CMR 4.03). The Nashua River and its major tributaries are shown on Figure 2-1.

Glacial outwash deposits constitute the primary aquifer at Fort Devens. Ground water also occurs in the underlying bedrock; however, flow is limited because the rocks have no primary porosity and water moves only in fractures and dissolution voids. Ground water in the surficial aquifer at Fort Devens has been assigned to Class I under CMR. Class I consists of ground waters that are "found in the saturated zone of unconsolidated deposits or consolidated rock and bedrock and are designated as a source of potable water supply" (314 CMR 6.03). Ground water provides the main source of potable water for Fort Devens. Ground water is pumped from three large-diameter and 74 small-diameter production wells.

2.4 Study Area Description and History

2.4.1 Study Area Description and Land Use

SA-51 is located adjacent to the O'Neill Building, on the western side of Lovell Street, across from SA-11 and the Nashua River (Figure 2-1). The O'Neill Building Compound serves as a training center for the Intelligence School. Training operations are conducted using transmitting vehicles and generators. The SA contains 12 circular gravel pads, identified on the site plan in Figure 4-1 by numbers 1 through 12. Eleven of the pads are used to park mobile vehicles containing equipment for Army personnel's training sessions. Pad 2 is currently the location of a bermed, concrete vehicle fueling and spill containment area with a drain and an oil-water separator. The vehicles are moved between pads, and typically only a few pads are in use at any one time. Pad 5 was being used to store old truck axles and other metal material at the start of this investigation. Some of the material was removed to allow site access for field sampling, and no evidence of surface staining was observed in the storage area.

2.0 Background and Physical Setting

The site is currently used as a communications training area for the Intelligence School. The parcel has been designated as Transitional Use: Army Reserve Enclave according to the *Devens Reuse Plan* (Vangasse Hangen Brustlin, Inc., 1994).

2.4.2 Background and Physical Setting

SA-51 was originally identified in the MEP and Enhanced PA as an area between Pads 10 and 11 where a history of spills and removal actions were documented. The SA was expanded to include all 12 pads to address the possibility that similar spill incidents had occurred at other pad areas.

South Hospital (referred to as Lovell Hospital in the MEP and PA) was located on the site until 1972. Underground foundations and piping associated with the hospital may remain on the site. The site was vacant from 1972 until 1984 or 1985 when the Thomas R. O'Neill Building was constructed.

Records of the Fort Devens Environmental Management Office (EMO), including the *Memorandum of Record - Spill Clean Up at the O'Neill Building Compound* dated April 9, 1990, indicate that on October 16, 1989, approximately 15 gallons of diesel fuel spilled from a petcock left open on a mobile generator on Pad 11. During the following investigation by the EMO, six additional areas of contaminated soil were identified on and between Pads 10 and 11. Five of these spills were fresh, small surface stains. One of the spills encompassed a much larger area.

Four phases of excavation were completed at the spill sites. During excavation, a photoionization detector (PID) was used to measure volatile organics. Soil showing PID readings greater than 10 micrograms per gram ($\mu\text{g/g}$) was removed. Confirmatory soil samples were collected from the excavation and submitted to a laboratory for total petroleum hydrocarbons (TPHC) analysis. The confirmatory samples from the first three cleanup phases at several of the spill areas showed TPHC levels over 100 $\mu\text{g/g}$, which, according to EMO memoranda, was the Massachusetts Department of Environmental Protection's (MADEP's) action level at the time. Confirmatory samples from the fourth phase of excavation indicated that TPHC concentrations were below 100 $\mu\text{g/g}$.

In addition to the cleanup activities described above, the EMO identified and excavated contaminated soil from Pad 3 in 1992. The excavation was filled with clean sand, and the excavated material is currently stored on Pad 2. Confirmation sample results were not available for review.

According to Fort Devens' personnel and EMO memoranda, diesel fuel, lubrication oil, antifreeze, and transmission oils are materials used as part of the current site operations. No polychlorinated biphenyl (PCB)-containing fluid is reportedly used on the site.

2.0 Background and Physical Setting

2.4.3 Geology of Study Area 51

The site is at an elevation of approximately 275 feet above MSL. Subsurface soils observed during the investigation were well sorted sands with some gravel. Based on area geology, this is interpreted as being a kame deposit. A layer of fill approximately 2 to 4 feet in thickness, consisting of poorly sorted sand and gravel, overlies the natural deposits. According to the *Detailed Flow Model for North and Main Posts, Fort Devens, Massachusetts* (Engineering Technologies Associates, 1994), bedrock is located at approximately 150 feet above MSL.

2.4.4 Hydrogeology of Study Area 51

The Detailed Flow Model reports the calculated ground water elevation in the glacial outwash (overburden) aquifer in this area at 222 feet above MSL, which is the approximate elevation of the Nashua River. Given the topographic relief between the river and SA-51, the ground water elevation is expected to be higher than that reported in the Detailed Flow Model. During ground water sampling operations at the site, the water table was estimated to be at approximately 40 feet below grade. Ground water flow in both the overburden and bedrock aquifers in this area is expected to be east, toward the Nashua River.

3.0 Site Investigation

3.1 Site Investigation Report

The SI was conducted from June to July 1993 in conformance with the *Revised Work Plan Addendum for the O'Neill Building Site* (Arthur D. Little, Inc., 1993a).

The scope of work for the SA-51 SI included the following activities:

- Review records and historical aerial photos and conduct interviews with Army's personnel.
- Collect soil samples from two depth intervals at 189 locations during two phases of work, as described below. All samples were analyzed for TPHC using a portable non-dispersive infrared (NDIR) spectrophotometer in a mobile laboratory established at Fort Devens.

Phase I - Soil samples collected at 0 to 2 feet and 4 to 6 feet beneath the gravel surface from 12 locations at each of 11 pads and five locations at Pad 2. Soil samples were also collected at four locations in a historical spill/cleanup area between Pads 10 and 11.

Phase II - Soil samples collected at 0 to 2 feet and 2 to 4 feet at seven locations around the perimeter of Pad 2 and an additional 41 locations around areas where Phase I data showed TPHC concentrations of greater than 50 µg/g. The sampling depth was changed from 4 to 6 feet, to 2 to 4 feet because Phase I data generally indicated no contamination at 4 to 6 feet.

- Perform confirmatory sample analysis by DataChem Laboratories with approximately 10 percent of the total number of samples submitted for TPHC and target analyte list (TAL) metals analysis.
- Collect three ground water samples downgradient of identified areas of TPHC contamination for field laboratory TPHC analysis (five ground water sample locations were attempted, but samples could not be retrieved with the Geoprobe® unit from two of the locations).

The Final SI Report (Arthur D. Little, Inc., 1993b) presents documentation of methods and activities performed during the Main Post SI and discusses the results of the SI, including conclusions and recommendations for each SA.

3.2 Supplemental Site Investigation

Based on results of the SI, it was determined that additional samples were required to evaluate ground water quality at the SA. Because SI ground water TPHC screening was performed in a field laboratory, it was necessary to confirm the presence of

3.0 Site Investigation

TPHC in ground water using a USAEC performance-demonstrated laboratory. The Supplemental SI scope of work included collecting ground water samples from two locations using a Geoprobe® small-diameter collection system near the SI ground water sample location at Pad 8.

The SSI report (Arthur D. Little, Inc., 1995) presents documentation of methods and activities performed during the Main Post SI. No further action is recommended for SA-51.

Sampling locations from the SI and SSI are shown on Figure 4-1.

3.3 Preliminary Risk Evaluation

The criteria and guidelines used for screening risks in the preliminary risk evaluation (PRE) are described below. A complete summary of criteria and guideline values used in the Main Post SI PREs is presented in the Final SI Report (Arthur D. Little, Inc., 1993b) and the SSI Report (Arthur D. Little, Inc., 1995). Uncertainties associated with the risk evaluation methodologies are also discussed in the Final SI Report.

3.3.1 Human Health Soil Risk Evaluation Methodology

EPA Region III Risk-Based Concentration Table (1993). The United States Environmental Protection Agency (EPA) Region III has developed risk-based soil concentrations based on published reference doses and cancer potency slopes and "standard" exposure scenarios. The concentrations reported correspond to a hazard quotient of 1, indicating no risk of noncarcinogenic effects, or a lifetime cancer risk of 1 in 1 million, whichever is lower. Both residential and commercial/industrial health-protective soil guidelines are published by EPA Region III.

Massachusetts Contingency Plan (MCP), July 1, 1993. Categories of health-protective soil guidelines were established by the Massachusetts Department of Environmental Protection (MADEP, 1993) for use in the characterization of risk posed by disposal sites. For assumed future residential use, SA concentrations are compared to the Method 1 GW-1/S-1 category. The S-1 category indicates that the soil is accessible and that both child and adult frequency or intensity of use may be high. The GW-1 category additionally assumes the potential use of the ground water as a drinking water source. For assumed future commercial/industrial use, SA soil concentrations are compared to the GW-1/S-2 category. The S-2 category indicates high adult use of the area, and minimal use of the area by children. For chemicals with no soil guidelines, we have used reportable concentrations published in the MCP guidelines. It should be noted that although Method 1 standards are used for screening purposes in the PRE, Method 1 is strictly applicable to a disposal site if there is a standard for each oil and hazardous material of concern, and if the oil or hazardous material is present in and will foreseeably migrate only within ground water and soil.

3.0 Site Investigation

3.3.2 Ecological Soil Risk Evaluation

Surface Soil Ecological Protective Contaminant Levels. The ecological criteria or guidelines used for comparison to detected concentrations in soils were derived from the ABB Environmental Services, Inc., Chronic Exposure Food Web Model (ABB Environmental Services, Inc., 1992). No state or federal standards or guidelines exist to evaluate potential effects due to the ingestion of food and surface soil by terrestrial organisms. In the 1993 SI Report for Groups 2 and 7 (ABB Environmental Services, Inc., 1993), ABB developed a food web model that derives protective contaminant levels (PCLs). The PCLs estimate the potential dietary exposure for several potential receptor species at Fort Devens, using published bioaccumulation factors (BAFs), dietary profiles, and ingestion rates for the indicator species. These PCLs are assumed to protect the most sensitive of the modeled indicator species (i.e., short-tailed shrew) from direct toxic effects and/or bioaccumulation-mediated toxic effects.

4.0 Contamination Assessment

4.1 Soil Sampling

A total of 376 samples were collected from depths between 0 and 6 feet at 189 locations across the site during the SI. All soil samples were analyzed in a field laboratory for TPHC. Confirmatory samples were selected from those samples showing the highest levels of TPHC, and submitted for laboratory analysis at a rate of 10 percent of the total samples collected at the site.

Concentrations of TPHC detected at the site ranged from non-detect to 608 $\mu\text{g/g}$. Only 51 of the 376 samples exceeded 100 $\mu\text{g/g}$ TPHC and only four of the samples exceeded 500 $\mu\text{g/g}$. TPHC was below the practical quantitation limit (PQL) of 10 $\mu\text{g/g}$ in almost 50 percent of the samples. Where contamination was detected, it was consistently within the upper 4 feet of soil, and in most cases, the highest concentrations were within the top 2 feet. TPHC concentrations in samples collected from the 4 to 6-foot interval were typically below the detection limit.

Results of TAL metals analysis are summarized in Table 4-1. Sixteen of the metals were detected above background levels. Results of the SI indicate the presence of isolated, small spills of petroleum product that, for the most part, are limited to the upper 2 to 4 feet of soil.

4.2 Ground Water

Three ground water samples were collected at the site during the SI and were analyzed for TPHC in the field laboratory. The sample locations were downgradient (east) of Pads 6, 8, and the historical spill area between Pads 10 and 11. Each sample location corresponded to areas where soil analyses showed the highest concentrations of TPHC.

TPHC was only detected in 1 of the 3 ground water samples. The ground water sample collected east of Pad 8 and analyzed in the field laboratory showed 5.7 mg/L TPHC. Two soil samples from Pad 8 had TPHC concentrations exceeding 400 $\mu\text{g/g}$ at the 0 to 2-foot depth interval. However, samples collected from these locations at 4 to 6 feet showed TPHC concentrations less than 10 $\mu\text{g/g}$, suggesting that the higher surface concentrations were not leaching down toward ground water. At 1 location, the TPHC concentration of 317 $\mu\text{g/g}$ at 4 to 6 feet was slightly higher than the 224 $\mu\text{g/g}$ concentration at 0 to 2 feet.

During the Supplemental SI, two additional ground water samples were collected from Pad 8 to confirm the detection of TPHC detected in ground water by field screening methods. The two samples were submitted to a USAEC performance-demonstrated laboratory for TPHC analysis. TPHC was not detected.

4.0 Contamination Assessment

1 Although field laboratory analysis of ground water during the SI investigation
2 indicated that TPHC may be present in ground water, Supplemental SI ground water
3 analysis by a USAEC performance-demonstrated laboratory did not show any
4 indication of ground water contamination.
5
6
7

5.0 Preliminary Risk Evaluation

5.1 Surface Soils

Only metals and TPHC were analyzed in soils for this SA. The detected analytes and their concentrations are listed in Table 4-1. Surface soil concentrations are compared to the lowest commercial/industrial soil criteria. However, the area is used as a training area, where individuals would only be exposed intermittently.

Inorganics. Inorganic analytes detected above background concentrations include: arsenic, barium, beryllium, calcium, chromium, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, sodium, vanadium, and zinc. Molybdenum was detected at 0.2 feet in 51B-93-01X, however, since there are no background data available, it cannot be determined whether concentrations detected are above background concentrations. In all cases other than arsenic and beryllium, the analytes were detected above background concentrations, but did not exceed the human health guideline.

Only two inorganic analytes exceeded the lowest commercial/industrial human health guidelines: arsenic and beryllium. Arsenic was detected at 38 µg/g (sample number 51B-93-12X), which is somewhat higher than the MCP health-protective value of 30 µg/g. However, it should be noted that the MCP value is quite conservative; it is the same as the residential guideline and is much lower than the EPA Region III commercial/industrial guideline of 310 µg/g that applies only to noncarcinogenic effects of arsenic. Beryllium only slightly exceeded the commercial industrial criteria of 0.67 µg/g with detects of 0.699 and 0.714 µg/g (51B-93-35X and -42X). Because the area will continue to be used as a training area with limited access, human risk due to exposure to these levels of arsenic and beryllium are likely to be insignificant.

The background concentration and the soil PCL were exceeded for arsenic, barium, chromium, lead, and mercury. Because this area is a fenced urban habitat, and has paved areas, gravel pads, and only scattered trees and shrubs, and Fort Devens is surrounded by large expanses of high-quality habitat, it is not likely to be a locally significant wildlife habitat.

Organic Compounds. Only TPHC were analyzed in soils. None of the TPHC detections exceeded the MCP commercial/industrial criterion of 2,500 µg/g. As a result, it is unlikely that human contact with the soils in SA-51 will result in any adverse health effects. No ecologically protective soil criterion was available for TPHC with which to evaluate possible ecological risks from the detected levels.

5.2 Ground Water

During the SI, TPHC were detected by NDIR in one of the three ground water samples (Pad 8) at a concentration of 5.7 mg/L, exceeding the human health criteria of 1 mg/L. However, SSI laboratory analysis of two samples also collected from Pad 8 indicated that there is no TPHC contamination in ground water.

6.0 Conclusions

No evidence of extensive or high-concentration petroleum contamination was observed during the investigation. The results of the investigation indicate that there is no TPHC contamination in ground water. The levels of TPHC and metals detected in soils indicate local areas of low-concentration petroleum contamination consistent with the historical use of the SA for diesel fuel-powered equipment. Based on the results of the PRE, the detected levels of these analytes are not likely to pose an unacceptable risk to human health or the environment.

No further action is recommended for SA-51, because of the restricted access to the site, which is enforced by fencing and security, and the plans for continued future use of the SA for Army training. These recommendations are based on the historical information regarding the use of the site, visual observations, and the results of sampling and analysis. The recommendations are also based in part on the results of a PRE.

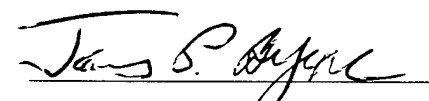
7.0 Decision

On the basis of findings at SA-51, there is no evidence or reason to conclude that the historical use of SA-51 for training operations has caused significant environmental contamination or poses a threat to human health or the environment. The decision has been made to remove SA-51 from further consideration in the Installation Restoration Program (IRP) process. In accordance with CERCLA 120(h)(3), all remedial actions necessary have taken place, and the EPA and MADEP signatures constitute concurrence in accordance with the same.


JAMES C. CHAMBERS
BRAC Environmental Coordinator

11 Sep 95
Date

U.S. ENVIRONMENTAL PROTECTION AGENCY

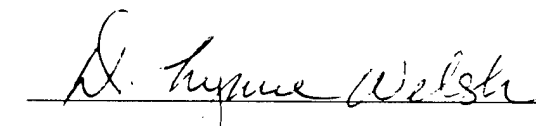

JAMES P. BYRNE
Fort Devens Remedial Project Manager

9/11/95
Date

☒ Concur

☐ Non-concur (please provide reasons for non-concurrence in writing)

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION


D. LYNNE WELSH
Section Chief, Federal Facilities - CERO

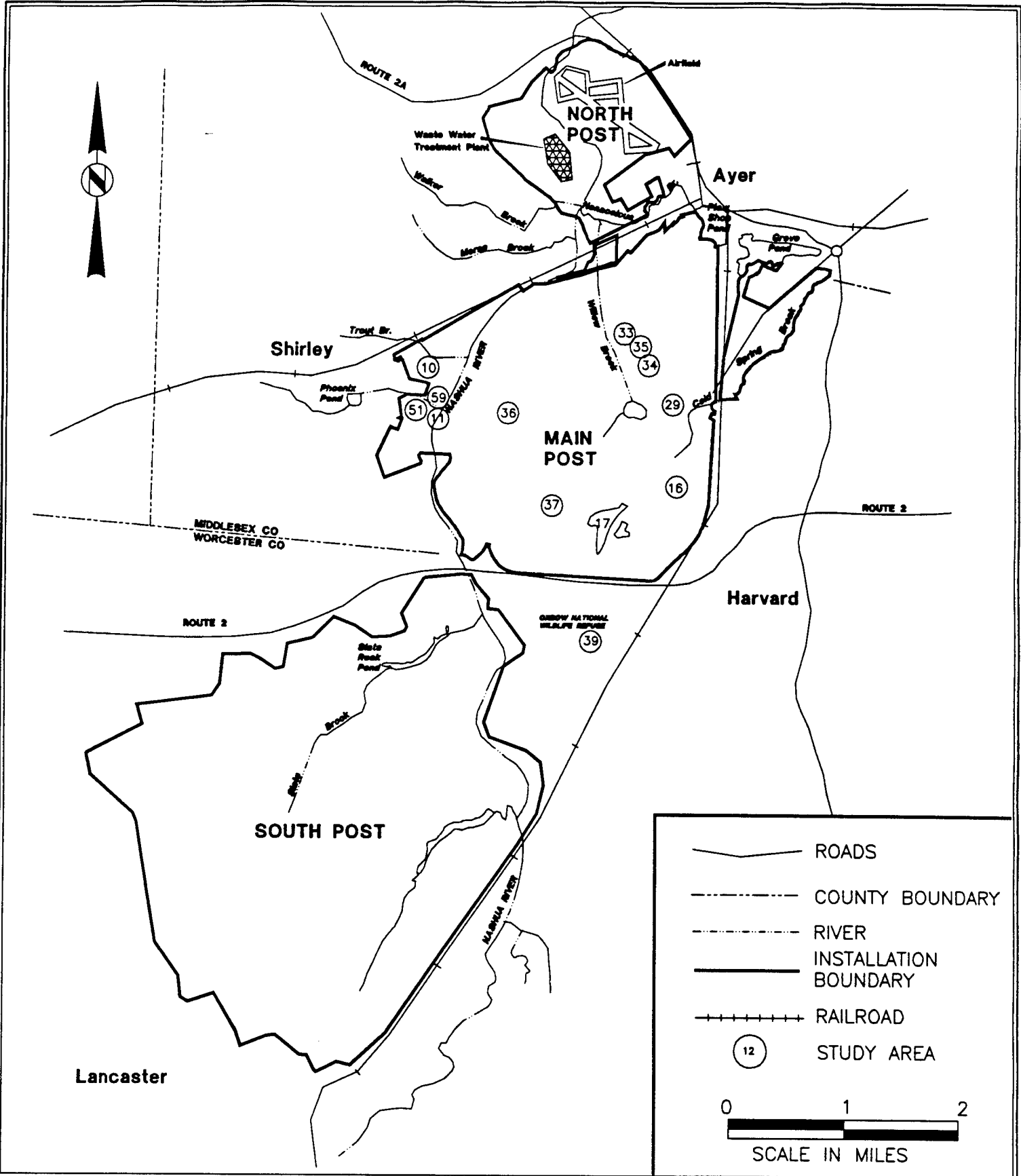
9/11/95
Date

☒ Concur

☐ Non-concur (please provide reasons for non-concurrence in writing)

8.0 References

- ABB Environmental Services, Inc. 1992. *Surface Soil Ecological Protective Contaminant Levels*.
- ABB Environmental Services, Inc. 1993. *Fort Devens Site Investigation Report. Groups 2, 7 & Historic Gas Station*. May.
- Arthur D. Little, Inc., 1993a. *Revised Work Plan Addendum for the O'Neill Building Site*. June.
- Arthur D. Little, Inc., 1993b. *Final Site Investigation Report, Main Post Site Investigation, Fort Devens, Massachusetts*. December.
- Arthur D. Little, Inc., 1995. *Supplemental Site Investigation Data Package, Main Post Site Investigation, Fort Devens, Massachusetts*. March.
- Biang, C.A., R.W. Peters, R.H. Pearl, and S.Y. Tsai, April 1992. *Master Environmental Plan for Fort Devens, Massachusetts*.
- Engineering Technologies Associates, Inc. 1994. *Detailed Flow Model for Main and North Post, Fort Devens, Massachusetts*. Prepared for USATHAMA. September.
- Fort Devens Environmental Management Office, 1990. *Memorandum of Record - Spill Clean Up at the O'Neill Building Compound*. April 9.
- Massachusetts Department of Environmental Protection. 1993. *Massachusetts Contingency Plan, Secretary of State Submittal*. July.
- Roy F. Weston, 1992. *Enhanced Preliminary Assessment, Fort Devens, Massachusetts*.
- U.S. Environmental Protection Agency Region III, 1993. *EPA Region III Risk-Based Concentration Table (Second Quarter, 1993)*.
- Vanesse Hangen Brustlin, Inc., 1994. *Devens Reuse Plan*. November.



PREPARED FOR:			TITLE:
USAEC			
DATE:	DWG. NO.:		
JUNE 1995	67064-008	FIGURE 2-1 LOCATION OF STUDY AREAS WITHIN FORT DEVENS	
SCALE:			
AS SHOWN			

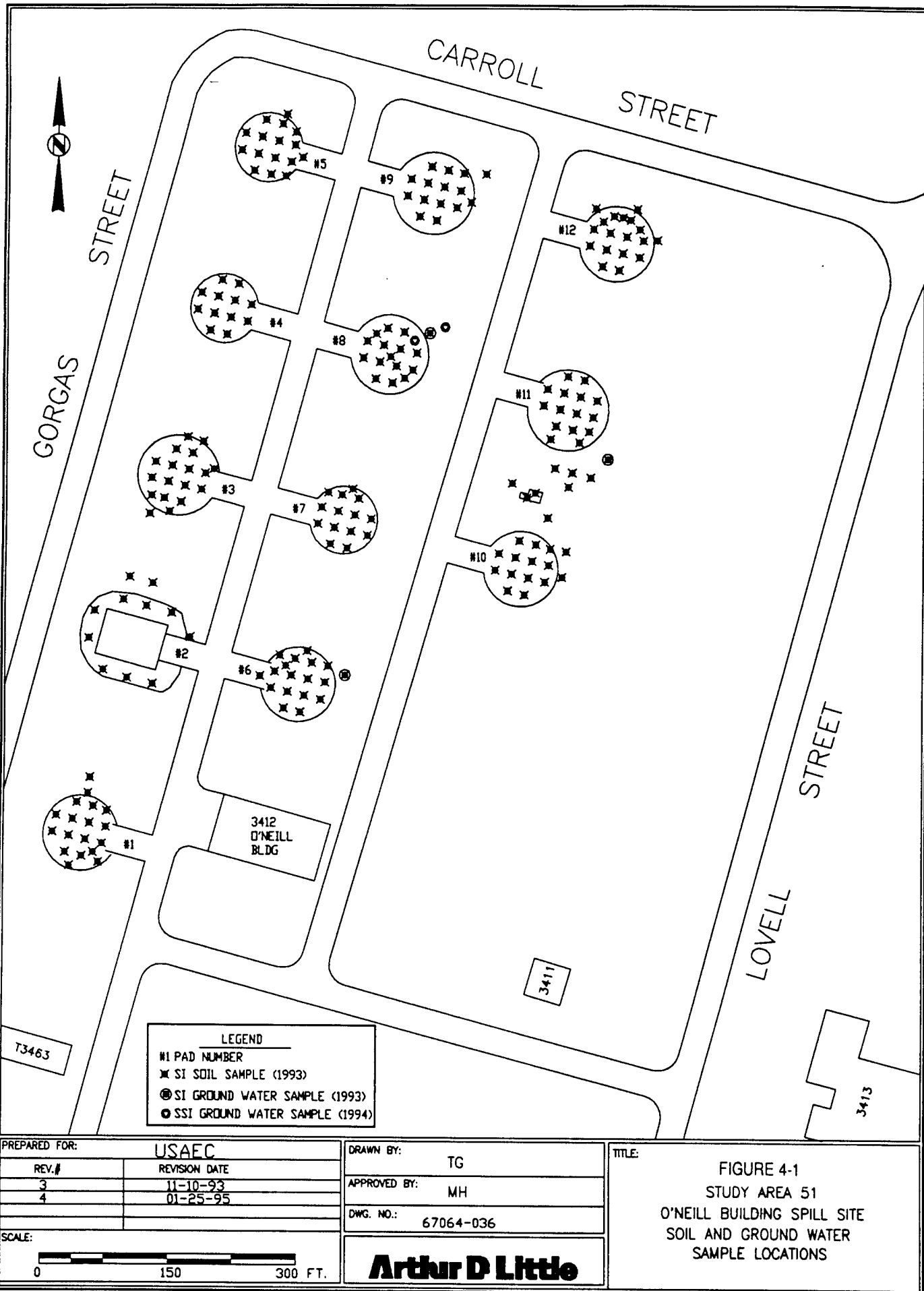


Table 4--1
Fort Devens Main Post Site Investigation
Study Area 51 - Analytes in Soil

Site ID Field Sample ID Sample Depth (ft)	FL Devens Soil Background	Commercial/ Industrial Criteria	Ecological/ Surface Soil Criteria	51B-93-01X AMXGP01U 0 - 2	51B-93-02X AMXGP02U 0 - 2	51B-93-03X AMXGP03U 0 - 2	51B-93-04X AMXGP04U 0 - 2	51B-93-05X AMXGP05U 0 - 2
Total Petroleum Hydrocarbons (ug/g)	--	2500	--	10 LT - - -	10 LT - - -	10 LT - - -	10 LT - - -	500 - - -
Metals (ug/g)								
Aluminum	15000	300000	1700	9650 - - E	8960 - - E	8190 - - E	7750 - - E	12000 - - E
Arsenic	21	30	33	12.5 - - -	8.61 - - -	11.9 - - -	9.66 - - -	17.9 - - -
Barium	42.5	72000	41	20.2 - - -	20.9 - - -	14.9 - - -	15.8 - - -	30.4 - - -
Beryllium	0.347	0.67	0.88	0.427 LT B -	0.427 LT B -	0.427 LT B -	0.427 LT B -	0.427 LT B -
Boron	--	92000	--	6.64 LT - -	6.64 LT - -	8 - - -	6.64 LT - -	9.4 - - -
Calcium	1400	--	--	542 - - -	650 - - -	1650 B - -	551 - - -	1310 - - -
Chromium	31	2500	180	268 B - E	16.2 - - -	11 - - -	11.8 - - -	24.8 - - -
Cobalt	--	100	50	6.11 - - -	5.46 - - -	3.58 - - -	4.04 - - -	7.32 - - -
Copper	8.39	38000	34	12.9 B - -	7.08 - - -	5.23 - - -	6.43 - - -	14.9 B - -
Iron	15000	--	--	25100 B - -	12000 - - -	10300 - - -	10100 - - -	18200 B - -
Lead	48.4	600	4	5.2 - - E	9 - - -	9.1 - - -	7.9 - - -	28 - - -
Magnesium	5600	--	--	2930 - - -	2500 - - -	1780 - - -	1890 - - -	4240 - - -
Manganese	300	5100	1500	207 - - -	158 - - -	123 - - -	155 - - -	222 - - -
Mercury	0.22	60	3.6	0.05 LT - -	0.05 LT - -	0.05 LT - -	0.05 LT - -	13.4 B - E
Molybdenum	--	5100	--	108 - - -	14.3 LT - -	14.3 LT - -	14.3 LT - -	14.3 LT - -
Nickel	14	700	100	21.2 B - -	11.3 - - -	8.14 - - -	10 - - -	18.7 B - -
Potassium	1700	--	--	1510 - - -	1230 - - -	676 - - -	757 - - -	1710 B - -
Selenium	--	2500	0.48	0.449 LT - -	0.449 LT - -	0.449 LT - -	0.449 LT - -	0.45 - - -
Sodium	131	--	--	67.3 - - -	72.5 - - -	64.5 - - -	49 - - -	146 B - -
Vanadium	28.7	7200	10	29.7 B - E	12.5 - - -	10.5 - - -	10 - - -	20.4 - - -
Zinc	35.5	2500	640	32.2 - - -	25.9 - - -	20.5 - - -	18.3 - - -	40.4 B - -

Notes:

LT = Less than detection limit

ND = Not detected

B = above Fort Devens soil background

H = above human health criteria

E = above eco. surface soil criteria

Table 4--1
Fort Devens Main Post Site Investigation
Study Area 51 - Analytes in Soil

Site ID Field Sample ID Sample Depth (ft)	Ft. Devens Soil Background	Commercial/ Industrial Criteria	Ecological/ Surface Soil Criteria	51B-93-05X AMXGP05U 0 - 2	51B-93-06X AMXGP06U 0 - 2	51B-93-07X AMXGP07U 0 - 2	51B-93-08X AMXGP08U 0 - 2	51B-93-09X AMXGP09U 0 - 2
Total Petroleum Hydrocarbons (ug/g)	--	2500	--	600	31	190	26	28
Total Petroleum Hydrocarbons (ug/g)								
Metals (ug/g)								
Aluminum	15000	300000	1700	11700	13100	9190	8160	8890
Arsenic	21	30	33	13.9	16.1	20.3	15.4	12.3
Barium	42.5	72000	41	37.5	31.4	24.8	27.4	19.4
Beryllium	0.347	0.67	0.88	0.427 LT B	0.427 LT B	0.427 LT	0.427 LT B	0.427 LT B
Boron	--	92000	--	6.64 LT	6.64 LT	17.1	11.2	11.7
Calcium	1400	--	--	1570 B	889	1020	1680 B	756
Chromium	31	2500	180	22.3	22.3	18.7	15.8	13.1
Cobalt	--	100	50	7.41	6.13	5.45	6.08	4.84
Copper	8.39	38000	34	16.4	10.5 B	22	14.8 B	7.92
Iron	15000	--	--	15300 B	17700 B	14200	14300	12500
Lead	48.4	600	4	13.4	15.3	57	18.3	14.6
Magnesium	5600	--	--	3480	3630	2700	2650	2190
Manganese	300	5100	1500	194	188	153	223	136
Mercury	0.22	60	3.6	0.449 LT B	0.05 LT	0.05 LT	0.05 LT	0.074
Molybdenum	--	5100	--	14.3 LT	14.3 LT	14.3 LT	14.3 LT	14.3 LT
Nickel	14	700	100	17.9 B	16.1 B	15.3	15.6 B	11
Potassium	1700	--	--	1540	1400	1090	1150	829
Selenium	--	2500	0.48	0.449 LT	0.449 LT	0.449 LT	0.449 LT	0.449 LT
Sodium	131	--	--	168 B	75.6	110	110	85.3
Vanadium	28.7	7200	10	16.5	18	14.9	13	12
Zinc	35.5	2500	640	34.1	36.3 B	72.6	46.6 B	27

Notes:

LT = Less than detection limit
 ND = Not detected
 B = above Fort Devens soil background
 H = above human health criteria
 E = above eco. surface soil criteria

Table 4--1
Fort Devens Main Post Site Investigation
Study Area 51 - Analytes in Soil

Site ID Field Sample ID Sample Depth (ft)	Fl. Devens Soil Background	Commercial/ Industrial Criteria	Ecological/ Surface Soil Criteria	51B-93-10X AMXGP10U 0 - 2	51B-93-12X AMXGP12U 0 - 2	51B-93-13X AMXGP13U 0 - 2	51B-93-14X AMXGP14U 0 - 2	51B-93-15X AMXGP15U 0 - 2
Total Petroleum Hydrocarbons (ug/g)	--	2500	--	16	87	37	340	10 LT
Total Petroleum Hydrocarbons (ug/g)	--	2500	--	16	87	37	340	10 LT
Metals (ug/g)								
Aluminum	15000	300000	1700	9970	12900	5730	10500	9820
Arsenic	21	30	33	14.7	38	16.6	16	7.17
Barium	42.5	72000	4.1	28.8	32.7	11.1	22.6	16.6
Beryllium	0.347	0.67	0.88	0.427 LT B	0.427 LT B	0.427 LT B	0.427 LT B	0.427 LT B
Boron	--	92000	--	6.64 LT	6.64 LT	6.64 LT	6.64 LT	6.64 LT
Calcium	1400	--	--	1110	1100	872	2090	748
Chromium	31	2500	180	16.1	28.7	14.5	26.7	11.5
Cobalt	100	100	50	4.89	9.26	4.86	7.21	3.27
Copper	8.39	38000	34	6.59	14.5	7.65	11.6	4.92
Iron	15000	--	--	12900	23300	11200	20200	10200
Lead	48.4	600	4	17.9	19.6	6.07	9.56	16.6
Magnesium	5600	--	--	2100	6590	3150	6210	1640
Manganese	300	5100	1500	285	288	156	223	117
Mercury	0.22	60	3.6	0.05 LT	0.05 LT	0.05 LT	0.05 LT	0.05 LT
Molybdenum	--	5100	--	14.3 LT	14.3 LT	14.3 LT	14.3 LT	14.3 LT
Nickel	14	700	100	12	28.8	17.1	29.2	8.08
Potassium	1700	--	--	967	1420	599	1300	792
Selenium	--	2500	0.48	0.449 LT	0.449 LT	0.449 LT	0.449 LT	0.449 LT
Sodium	131	--	--	79.7	73.6	38.7	75.9	58.6
Vanadium	28.7	7200	10	14.4	19.4	9.28	16.3	11
Zinc	35.5	2500	640	31.4	46.5	21	35.2	21.9

Notes:

LT = Less than detection limit

ND = Not detected

B = above Fort Devens soil background

H = above human health criteria

E = above eco. surface soil criteria

6/14/95

Table 4--1
Fort Devens Main Post Site Investigation
Study Area 51 - Analytes in Soil

Site ID Field Sample ID Sample Depth (ft)	Fl. Devens Soil Background	Commercial/ Industrial Criteria	Ecological/ Surface Soil Criteria	51B-93-16X AMXGP16U 0 - 2	51B-93-18X AMXGP18U 0 - 2	51B-93-19X AMXGP19U 0 - 2	51B-93-20X AMXGP20U 0 - 2	51B-93-21X AMXGP21U 0 - 2
Total Petroleum Hydrocarbons (ug/g)	--	2500	--	10 LT	78	2000	370	10 LT
Total Petroleum Hydrocarbons (ug/g)								
Metals (ug/g)								
Aluminum	15000	300000	1700	14800	10000	9270	11100	9590
Arsenic	21	30	33	8.62	19.8	11.7	21.9	13.5
Barium	42.5	72000	41	26.1	29.4	21.6	27	32
Beryllium	0.347	0.67	0.88	0.552	0.599	0.427 LT B	0.427 LT B	0.53 B
Boron	--	92000	--	12.3	11.3	6.64 LT	12.3	6.64 LT
Calcium	1400	--	--	3380	1220	1050	1530	1130
Chromium	31	2500	180	21.1	22.7	21.8	17.2	17.5
Cobalt	--	100	50	6.53	7.22	6.3	5.08	7.54
Copper	8.39	38000	34	18.2	15.3	8.53	9.12	14.4
Iron	15000	--	--	16900	17700	14200	14800	19700
Lead	48.4	600	4	12.7	21	14.9	17.1	18.6
Magnesium	5600	--	--	3220	3620	3990	2810	3310
Manganese	300	5100	1500	198	276	200	192	305
Mercury	0.22	60	3.6	0.05 LT	0.062	0.05 LT	0.05 LT	0.05 LT
Molybdenum	--	5100	--	14.3 LT	14.3	14.3 LT	14.3 LT	14.3
Nickel	14	700	100	14.1	21.9	17	14.6	26.7
Potassium	1700	--	--	1350	1530	1140	1210	827
Selenium	--	2500	0.48	0.449 LT	0.449 LT	0.449 LT	0.449 LT	0.449 LT
Sodium	131	--	--	656	143	82.4	87.5	75.4
Vanadium	28.7	7200	10	22.3	16.4	16.1	15.3	14.2
Zinc	35.5	2500	640	35	41.4	31.3	32.2	30.3

Notes:

LT = Less than detection limit

ND = Not detected

B = above Fort Devens soil background

H = above human health criteria

E = above eco. surface soil criteria

6/14/95

Table 4--1
Fort Devens Main Post Site Investigation
Study Area 51 - Analytes in Soil

Site ID Field Sample ID Sample Depth (ft)	Fl. Devens Background	Commercial/ Industrial Criteria	Ecological/ Surface Soil Criteria	51B-83-22X AMXGP22U 0 - 2	51B-83-23X AMXGP23U 0 - 2	51B-83-24X AMXGP24U 0 - 2	51B-83-25X AMXGP25U 0 - 2
Total Petroleum Hydrocarbons (ug/g)	--	2500	--	630	220	80	72
Total Petroleum Hydrocarbons (ug/g)	--	2500	--	630	220	80	72
Metals (ug/g)							
Aluminum	15000	300000	1700	9860	8850	8700	8890
Arsenic	21	30	33	12.6	10.1	11.4	10.8
Barium	42.5	72000	41	37.2	32.9	21	19.1
Beryllium	0.347	0.67	0.88	0.427	0.427	0.427	0.427
Boron	--	92000	--	6.64	6.64	6.64	6.64
Calcium	1400	--	--	1470	891	649	753
Chromium	31	2500	180	23.9	17.6	13.8	13
Cobalt	--	100	50	6.2	7.45	4.27	4.06
Copper	8.39	38000	34	12.9	9.2	9.67	9.42
Iron	15000	--	--	17400	11900	11100	14700
Lead	48.4	600	4	62	170	40	38
Magnesium	5600	--	--	3800	3120	2010	2360
Manganese	300	5100	1500	197	493	149	152
Mercury	0.22	60	3.6	0.05	0.05	0.05	0.05
Molybdenum	--	5100	--	14.3	14.3	14.3	14.3
Nickel	14	700	100	19	20.9	10.6	12.5
Potassium	1700	--	--	1170	841	772	679
Selenium	--	2500	0.48	0.449	0.449	0.449	0.449
Sodium	131	--	--	76.3	71.6	53.9	50.1
Vanadium	28.7	7200	10	19.6	14.2	12.4	12.3
Zinc	35.5	2500	640	71.7	128	50	49.3

Notes:

LT = Less than detection limit
 ND = Not detected
 B = above Fort Devens soil background
 H = above human health criteria
 E = above eco. surface soil criteria

Table 4-1
Fort Devens Main Post Site Investigation
Study Area 51 - Analytes in Soil

Site ID Field Sample ID Sample Depth (ft)	FL Devens Soil Background	Commercial/ Industrial Criteria	Ecological Surface Soil Criteria	51B-93-26X AMXGP26U 0 - 2	51B-93-30X AMXGP30U 0 - 2	51B-93-31X AMXGP31U 0 - 2	51B-93-32X AMXGP32U 0 - 2
Total Petroleum Hydrocarbons (ug/g)	-	2500	-	13	170	710	330
Total Petroleum Hydrocarbons (ug/g)	-	-	-	-	-	-	-
Metals (ug/g)							
Aluminum	15000	300000	1700	8580	8480	7910	11900
Arsenic	21	30	33	13.9	9.58	14.3	18
Barium	42.5	72000	41	19.1	23.1	17.3	27.7
Beryllium	0.347	0.67	0.88	0.427 LT B	0.548 B	0.427 LT B	0.427 LT B
Boron	-	92000	-	6.64 LT	6.64 LT	6.64 LT	6.64 LT
Calcium	1400	-	-	794	303	523	2110
Chromium	31	2500	180	20.4	16.5	14.9	27.3
Cobalt	-	100	50	5.24	4.59	6.22	8.3
Copper	8.39	38000	34	11.8 B	8.02	11.8 B	16.6 B
Iron	15000	-	-	12900	11800	14400	22600
Lead	48.4	600	4	17	18	6.94	18.6
Magnesium	5600	-	-	2920	2510	2800	5760
Manganese	300	5100	1500	243	133	181	262
Mercury	0.22	60	3.6	0.05 LT	0.05 LT	0.05 LT	0.05 LT
Molybdenum	-	5100	-	14.3 LT	14.3 LT	14.3 LT	14.3 LT
Nickel	14	700	100	13.5	10.8	14.4	27.2
Potassium	1700	-	-	813	986	867	1380
Selenium	-	2500	0.48	0.449 LT	0.449 LT	0.449 LT	0.449 LT
Sodium	131	-	-	70.1	38.7 LT	61.1	197
Vanadium	28.7	7200	10	16.7	13	12.1	20.8
Zinc	35.5	2500	640	29.3	26.2	26.6	42.6

Notes:

LT = Less than detection limit
 ND = Not detected
 B = above Fort Devens soil background
 H = above human health criteria
 E = above eco. surface soil criteria

6/14/95

Table 4--1
Fort Devens Main Post Site Investigation
Study Area 51 - Analytes in Soil

Site ID Field Sample ID Sample Depth (ft)	FL Devens Soil Background	Commercial/ Industrial Criteria	Ecological Surface Soil Criteria	51B-93-33X AMXGP33M 0 - 2	51B-93-34X AMXGP34U 0 - 2	51B-93-35X AMXGP35U 0 - 2	51B-93-36X AMXGP36U 0 - 2	51B-93-37X AMXGP37M 0 - 2
Total Petroleum Hydrocarbons (ug/g)	--	2500	--	270	47	180	480	63
Total Petroleum Hydrocarbons (ug/g)	--	2500	--	270	47	180	480	63
Metals (ug/g)								
Aluminum	15000	300000	1700	10400	6480	14800	10500	10400
Arsenic	21	30	33	4.29	11.9	14.6	9.18	21.9
Barium	42.5	72000	41	40.7	25.8	64.9	26.9	25.2
Beryllium	0.347	0.67	0.88	0.606	0.427 LT	0.699 B H	0.594 B	0.427 LT B
Boron	--	92000	--	6.64 LT	6.64 LT	6.64 LT	6.64 LT	6.64 LT
Calcium	1400	--	--	9080 B	883	2970 B	1150	1670 B
Chromium	31	2500	180	21.1	9.1	58.2 B	20.2	18.4
Cobalt	--	100	50	5.43	4.65	6.77	4.7	5.7
Copper	8.39	38000	34	10.5	8.02	13.4 B	8.82 B	12.3 B
Iron	15000	--	--	15100 B	9140	13300	12100	15900 B
Lead	48.4	600	4	330 B E	340	60 B E	550 B E	32
Magnesium	5600	--	--	2810	1730	4030	2460	2900
Manganese	300	5100	1500	165	125	151	145	181
Mercury	0.22	60	3.6	0.114	0.05 LT	0.074	0.108	0.05 LT
Molybdenum	--	5100	--	14.3 LT	14.3 LT	14.3 LT	14.3 LT	14.3 LT
Nickel	14	700	100	81.1 B	8.2	22.4 B	11.4	14.8 B
Potassium	1700	--	--	1040	1380	2670 B	1070	1050
Selenium	--	2500	0.48	0.449 LT	0.449 LT	0.449 LT	0.449 LT	0.449 LT
Sodium	131	--	--	89.4	38.7 LT	241	61.6	61.7
Vanadium	28.7	7200	10	16.2	9.33	21.6	16.6	13.6
Zinc	35.5	2500	640	340 B	122	38.9 B	101 B	45.1 B

Notes:

LT = Less than detection limit

ND = Not detected

B = above Fort Devens soil background

H = above human health criteria

E = above eco. surface soil criteria

6/14/95

Table 4-1
Fort Devens Main Post Site Investigation
Study Area 51 - Analytes in Soil

Site ID Field Sample ID Sample Depth (ft)	FL Devens Background	Commercial/ Industrial Criteria	Ecological/ Surface Soil Criteria	51B-83-38X AMXGP38M 0 - 2	51B-83-39X AMXGP39U 0 - 2	51B-83-40X AMXGP40U 0 - 2	51B-83-41X AMXGP41U 0 - 2	51B-83-42X AMXGP42U 0 - 2
Total Petroleum Hydrocarbons (ug/g)	--	2500	--	110	140	140	10 LT	170
Total Petroleum Hydrocarbons (ug/g)	--	2500	--	110	140	140	10 LT	170
Metals (ug/g)								
Aluminum	15000	300000	1700	8320	10100	11700	11200	13100
Arsenic	21	30	33	13.8	10.9	20.7	10.8	12.5
Barium	42.5	72000	41	24.7	28.8	30.8	32.1	42.9
Beryllium	0.347	0.67	0.88	0.546	0.536	0.645	0.63	0.714
Boron	--	92000	--	8.45	6.64 LT	6.64 LT	6.64 LT	6.64 LT
Calcium	1400	--	--	1780	876	1290	1350	1740
Chromium	31	2500	180	16.6	15.4	30.1	22.8	20.1
Cobalt	--	100	50	5.51	4.9	8.89	7.47	5.46
Copper	8.39	38000	34	8.94	9.46	17.6	16.5	12.3
Iron	15000	--	--	12300	21700	22200	17000	16700
Lead	48.4	600	4	52	26	26	7.91	210
Magnesium	5600	--	--	2030	2510	5810	3840	2580
Manganese	300	5100	1500	148	154	328	266	189
Mercury	0.22	60	3.6	0.081	0.05 LT	0.05 LT	0.05 LT	0.165
Molybdenum	--	5100	--	14.3	14.3 LT	14.3 LT	14.3 LT	14.3 LT
Nickel	14	700	100	12.2	13.4	30.6	18.6	13.5
Potassium	1700	--	--	824	1170	1330	1390	821
Selenium	--	2500	0.48	0.449 LT	0.449 LT	0.449 LT	0.449 LT	0.449 LT
Sodium	131	--	--	73.5	60.1	69.1	178	56.1
Vanadium	28.7	7200	10	13.6	13.9	16.8	16.8	17.5
Zinc	35.5	2500	640	53.4	30.6	60.4	29.3	296

Notes:

LT = Less than detection limit

ND = Not detected

B = above Fort Devens soil background

H = above human health criteria

E = above eco. surface soil criteria

6/14/95